Unit 1 Day 4

Section 1.6
Rational Exponents

THIS TENDS TO TAKE TWO DAYS . . . BREAK APART?
LOOK AT SAVED NOTES.

Definitions and Rules for Exponents

Let r and s be rational numbers. The results here are valid for all positive numbers a and b.

$a^r \cdot a^s = a^{r+s}$	$(ab)^r = a^r \cdot b^r$	$(a^r)^s = a^{rs}$
$\frac{a^r}{a^s} = a^{r-s}$	$\left(\frac{a}{b}\right)^r = \frac{a^r}{b^r}$	$a^{-r} = \frac{1}{a^r}$
$a^0 = 1$		

Rational Exponent

For all integers m, all positive integers n, and all real numbers a for which $a^{1/n}$ is a real number:

$$a^{m/n} = \left(a^{1/n}\right)^m .$$

Perform each operation mentally.

1) $\dfrac{3.3^3}{1.1^3} = \left(\dfrac{3.3}{1.1}\right)^3$

$= 3^3$

$= 27$

2) $(.25^2)(44^2) =$

$[(.25)(44)]^2$

11^2

121

If $(x^2)^3 = (20)^3$, what is x^6 ?

$x^6 = 20^3$

$x^6 = 8000$

$[(10)(2)]^3$

8000

Simplify using the rules of exponents (only positive exponents)

1) $\left(x^{\frac{3}{2}}y^{\frac{1}{5}}\right)^{10}$

$x^{\frac{3}{2}\cdot 10}\ y^{\frac{1}{5}\cdot 10}$

$\boxed{x^{15}\ y^{2}}$

2) $\left(y^{z+2}\right)^{4}$

$= y^{(z+2)(4)}$

$= \boxed{y^{4z+8}}$

3) $\dfrac{(x-1)^5}{(x-1)^3}$

$(x-1)^2$

4) $\left(\dfrac{4xy^5z^2}{x^{-2}yz^3}\right)^{\frac{1}{2}} = \left(\dfrac{4x^3y^4}{z}\right)^{1/2}$

$\dfrac{(4x^3y^4)^{1/2}}{z^{1/2}} = \dfrac{4^{1/2}x^{3/2}y^2}{z^{1/2}}$

$= \boxed{\dfrac{2x^{3/2}y^2}{z^{1/2}}}$

$\dfrac{x^1}{x^{-2}} = x^{1-(-2)} = x^3$

5) $\dfrac{2^{\frac{1}{4}} \cdot 2^{\frac{5}{4}}}{2^4} = \dfrac{2^{3/2}}{2^4}$

$= 2^{-\frac{5}{2}} = \dfrac{1}{2^{5/2}}$

$\frac{3}{2} - 4 = \frac{3}{2} - \frac{8}{2} = -\frac{5}{2}$

6) $\dfrac{(x^3)^{y+2}}{2x^y}$ where $y < -3$

$= \dfrac{x^{3y+6}}{2^1 x^y} = \dfrac{x^{3y+6-y}}{2} =$

$\dfrac{x^{2y+6}}{2} = \dfrac{1}{2x^{-(2y+6)}}$

$\dfrac{1}{2x^{-2y-6}}$

7) $\dfrac{(x^3)^{y+2}}{2x^y}$ where $y > 0$

$\dfrac{x^{3y+6}}{2x^y} = \boxed{\dfrac{x^{2y+6}}{2}}$

$\dfrac{x^{3y+6}}{x^y} = x^{3y+6-y} = x^{2y+6}$

8) $\left(\dfrac{x^{14}(x^5)^{-9}}{(2x^7)^2}\right)^{-\frac{1}{7}} =$

$\left(\dfrac{x^{14}(x^{-45})}{4x^{14}}\right)^{-1/7} = \left(\dfrac{x^{-45}}{4}\right)^{-1/7}$

$= \left(\dfrac{4}{x^{-45}}\right)^{1/7} = \left(4x^{45}\right)^{1/7} = 4^{1/7}x^{45/7}$

9)

$$\frac{(3m^3)^2(mn)^{-1}}{(25m^{14}n^{-4})^{\frac{1}{2}}} = \frac{9m^6}{5m^7n^{-2}(mn)}$$

$$\frac{9n^2}{5m(mn)} = \frac{9n}{5m^2}$$

10)

$$\left[\left(\frac{1}{4}x^{-4}y\right)^{-2}\left(-\frac{1}{2}xy^5\right)^2\right]^3 =$$

Homework:

Day 4 Assignments

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pg 61: 29-52,
pg 63-64: 97-100 all